Drink your Greens ?

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Introduction

Juicing is becoming an increasingly popular way to increase daily consumption of fruits and vegetables. It is promoted as a healthy method, as it is said to release the nutrients into the juice. Fresh vegetable juices are promoted as an alternative to a regular diet or as a slimming diet. Both scenarios involve the regular and arguably excessive consumption of juices, that could be detrimental to health. For example, oxalate is a plant product found in vegetables to a variable extent. It is responsible for the majority of kidney stones and dietary soluble oxalate is one contributor to stone formation. Population health studies in the USA between 1964-1972 and 1988-1994 indicated that a doubling in kidney stone disease has occurred. It is estimated 15% of men and 6% of women are affected in their lifetime with diet and lifestyle factors implicated as causative factors.

Method

Green juices can be made at home using two readily available types of equipment:

- Masticating juicer: separates the vegetables into juice and solid plant material (fibre), which is normally discarded.
- Blender, a high speed blender with no product separation.

In this experiment a masticating juicer was evaluated (Oscar 9000). Five different spinach based green juice recipes were chosen, as spinach is a high oxalate containing vegetable (Table 1). Oxalate contents and calcium in the juice and fibre fractions of each recipe were measured.

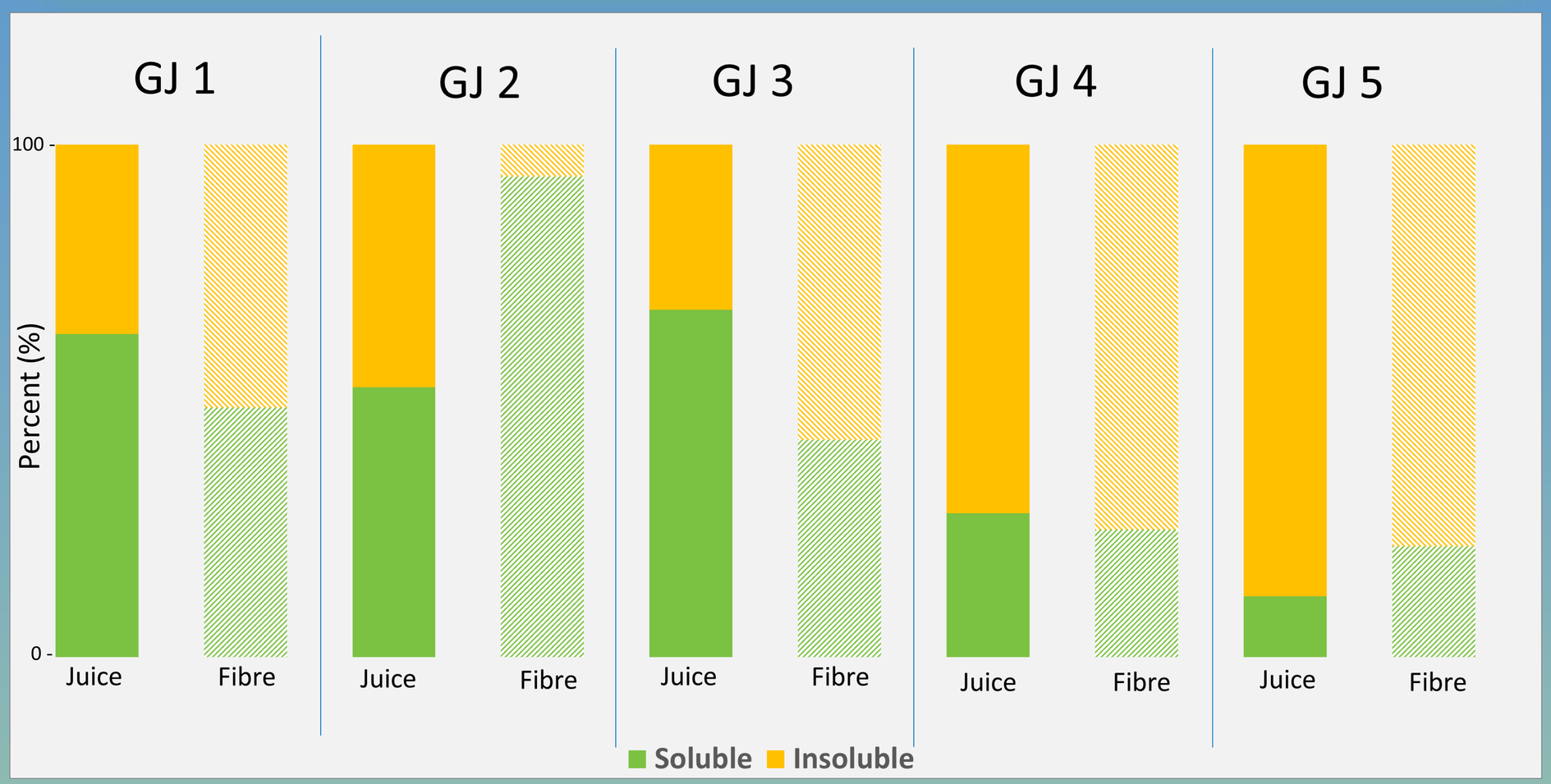

Figure 1. Ratio (%) of soluble/insoluble oxalic in green juice and fibre fractions.

Results

The soluble oxalate content of the five different green juices ranged from 11.9 to 67.8% (Figure 1). The fibre fraction contained appreciable amounts of soluble and insoluble oxalate; a large proportion of the calcium was also bound to the fibre fraction (Table 2). There appeared to be no relationship between juice pH and titre, with respect to soluble oxalate content, as the lowest soluble oxalate juice (GJ 5) had a similarly low titre to GJ2, a high soluble oxalate juice. However, GJ 5 had the highest pH, which would theoretically mean that greater amounts of the unprotonated form of oxalate would be found in the juice.

Conclusion

The fibre fraction (which is normally discarded) binds both soluble and insoluble oxalate, and also a mean of 81.4% of the total calcium in the original fruit and vegetable mixture. This is an important loss when only a juice diet is consumed. While spinach would have contributed the largest amount of oxalate to the juices the other ingredients in the recipes had an important influence on the proportion of soluble and insoluble oxalates in the juices.

	GJ 1		GJ 2		GJ 3		GJ 4		GJ 5	
	Juice	Fibre	Juice	Fibre	Juice	Fibre	Juice	Fibre	Juice	Fibre
Ca ratio (%)	35	65	14	86	16	84	10	90	18	82

Table 2. Calcium ratio of green juices

	GJ 1	GJ 2	GJ 3	GJ 4	GJ 5
Apples			33.6	34.6	42.8
Blueberry		27.8			
Celery	14.9		7.5		26.7
Cucumber	14.9			28.8	
Ginger	0.9				
Green capsicum	9.0				
Kale	7.5		13.9		
Lemon	14.0		4.5	8.5	
Pak koy	18.4				
Parsley	0.4		2.6	2.8	
Pear		41.0			
Red capsicum				4.8	
Spinach	20.1	31.2	38.0	20.6	30.5
Yield					
Juice	73.2	84.3	74.3	80.32	80.8
Fibre	26.8	12.9	22.9	14.22	15.6
Waste	2.1	2.7	2.7	5.46	3.6
pH	4.35	4.26	4.54	4.18	4.95
Titre (mL 0.1M NaOH)	7.28	3.41	6.18	7.07	2.66

Table 1. Green Juice Composition (%)

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